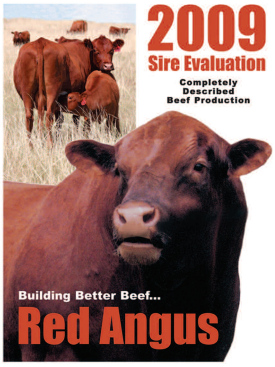

EPDs 101

by Larry Keenan, RAAA Director of Breed Improvement

One of the primary reasons for the existence of breed associations is to provide tools that allow for improvement of the breed population, and ultimately improve the reliability with which these breeds pass traits on to commercial customers. These tools should be used in selection of animals to remain in the population, and identification of animals to be utilized in breeding decisions that will produce the next generation of offspring. The Ranchers' Guide to EPDs brochure provides an excellent overview of RAAA EPDs; however, the balance of this article provides a deeper look into the science of Animal Breeding and its application to genetic progress.

In order to increase the competitive advantage of the Red Angus product it is imperative that we implement tools and strategies that allow for genetic improvement.

Genetic Value vs. Breeding Value

Genetic improvement necessitates the production of cattle which express a superior phenotype for those traits that have an impact on a producer's profitability. In order to create such animals we must determine the proportion of an animal's total genetic value that has the potential to be transmitted to their offspring. This genetic component is referred to as an animal's breeding value. Due to the fact that an animal's breeding value for any particular trait cannot be directly measured, we must calculate an estimated breeding value (EBV). These EBV calculations are based on performance data of the animal and all related individuals. EBVs are ideal in describing the genetics of a particular animal; however, during sperm and egg (gamete) production an animal randomly contributes 50% of their genetics. Therefore, in predicting the relative performance of progeny it is more applicable to take half of a parents EBV, which is termed Expected Progeny Difference (EPD). It is important to remember that numerous (sometimes hundreds) genes, with varying impacts, have an affect on traits important to beef production. Therefore, an animal that has an above average phenotype for a given trait may possess "good" genes, as well as "bad" genes, for that particular trait. During the process of random sampling of genes during

sperm/egg production, the gamete may possess any number of possible combinations of genes; therefore contributing different impacts on a trait. It's due to this reality that increases the complexity of calculating EPDs.

RAAA National Cattle Evaluation

EPD calculations are statistically based and become extremely complex. In their most simplistic form an animal's EPD is calculated by taking the average of the sire and dam EPD. Often referred to as a Parental EPD, this genetic prediction is unreliable as it does not include performance information on the animal. Once performance information is submitted to RAAA, in-house EPD calculations are performed which account for the performance of the particular animal as well as other animals in their contemporary group (a group of animals given equal opportunity to perform). This EPD is termed an Interim EPD, which lacks the ability to fully account for mating bias and performance of related animals. These obstacles are overcome biannually when RAAA performs a National Cattle Evaluation (NCE), which is performed by Colorado State University Center for the Genetic Evaluation of Livestock (CSU-CGEL). At CSU-CGEL, Best Linear Unbiased Prediction (BLUP) methodology is used to calculate EPDs. This methodology has the ability to account for environmental effects, mating bias, and performance of all related individuals in order to predict an animals breeding value. These calculations are extremely advanced and can not be simply calculated on a calculator or an "off the shelf" computer program.

An additional statistic calculated during the NCE is Accuracy (ACC). ACC is a descriptor of the reliability of an animal's predicted breeding value (EPD) for the trait being evaluated. ACC ranges from 0 to 1 (0 = weak relationship, 1 = strong relationship). For example, an animal that has an EPD with a .99 ACC can be interpreted as meaning the EPD is a very accurate prediction of the animal's true breeding value. Conversely, an animal with a .25 ACC should be understood to mean the EPD is not an accurate prediction of the animal's true breeding value and the EPD can change as more data is collected.

Two major factors contributing to ACC calculations: 1) amount of performance data used in an animals EPD calculation, and 2) heritability (strength of the relationship between performance and breeding value of a particular trait) of the trait being evaluated. Just as in any

prediction calculation, the more performance data included directly results in a more accurate prediction. In addition, as heritability increases the more useful each piece of performance data becomes in predicting the animals breeding value.

Genetic Change

The sole reason of using EPDs in breeding decisions is to make the next generation of animals genetically better; therefore, having a better product to market. This concept is commonly referred to as genetic change. Genetic change consists of ACC of EPDs used in selection, selection intensity and variation of genetics in the current herd. Selection intensity is simply how demanding producers are in selecting animals to include in their breeding program. As selection intensity increases, genetic change can be made at a more rapid pace. The variability of breeding values within a population can be used to describe genetic variation. If genetic variation is vast, future generations of progeny will be better on average if producers only use breeding animals that are superior for the trait being selected on. The rate at which genetic change can be made is dependent on generation interval – the length of time to replace one generation with the next. As generation interval increases, the rate at which genetic change can be made is reduced.

In order to increase the competitive advantage of the Red Angus product it is imperative that we implement tools and strategies that allow for genetic improvement. Although producers may use strategies in varying degrees to make genetic change, it is critical that all producers strive to improve the genetics of their herd. Therefore, making the entire Red Angus population better, which will further increase the demand for Red Angus cattle. ■